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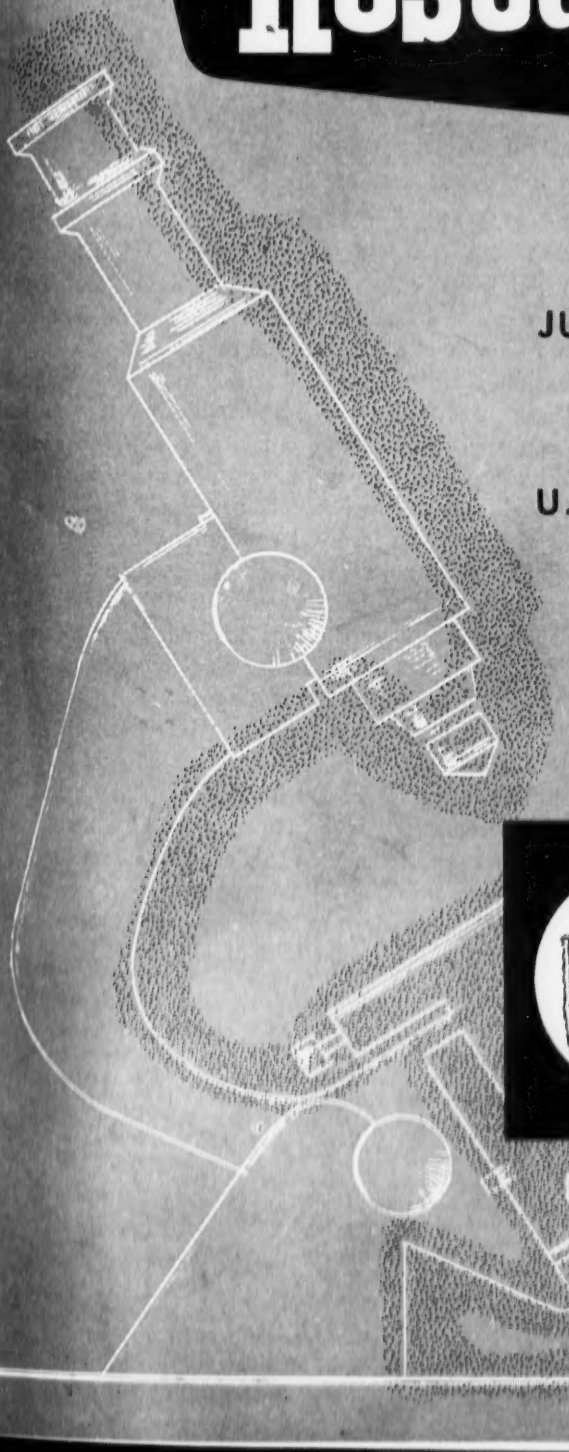


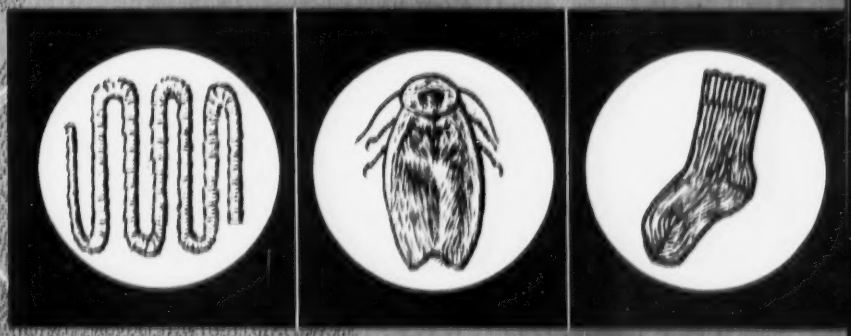
JULY 1957

U. S. DEPARTMENT OF AGRICULTURE

MENACE see page 10

ASSIST see page 8

ADVANCE see page 6



AGRICULTURAL
Research

Vol. 6—July 1957—No. 1

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Plans

A significant step in animal-disease research—the second such step in the last year—is now being taken by ARS.

The new laboratory for study of *domestic* diseases has begun to take form on paper. Congress approved funds for construction on a site provided by Iowa near Iowa State College, at Ames. It's hoped that final drawings can be approved early next year, with the plant finished in 1960.

We have already made a notable research beginning at the new laboratory that opened last September on Plum Island, off New York. This laboratory is for work on *foreign* diseases—priority to foot-and-mouth, which is too dangerous to risk bringing into the heart of the livestock country.

The Iowa laboratory will replace animal-disease facilities now at Beltsville, Md., and old laboratories vacated in Washington, D. C. It will provide space for both research and regulatory work on diseases that are giving us trouble.

The plans call for facilities and sufficient staff to conduct research on 25 animal diseases at the same time.

Main buildings will occupy 12 to 15 acres. The remainder of the 318-acre tract will be used to provide quarters and pasture for as many as 500 large animals, 2,000 small animals, and 2,000 poultry—which may be needed at one time. In the past, animal-disease researchers often lacked enough of the right kind of animals to insure dependable results.

Nearly 500 people, including about 100 principal scientists, will be employed at the center when it's fully staffed. (Naturally, elaborate safety precautions will be taken to protect the people working at the laboratory as well as to safeguard people and livestock in the surrounding area.)

We will be in position to make full-scale attacks on several diseases that haven't yet yielded to research efforts.

The solidly established work with States will be continued. The Ames laboratory, dealing primarily with national problems, will support and strengthen this cooperative effort.

These plans are ambitious. They *have* to be to enable us to meet the problems we face in the struggle to develop a livestock industry that's free of transmissible disease.

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AGRICULTURAL RESEARCH SERVICE
United States Department of Agriculture

DEPOSITED BY THE
UNITED STATES OF AMERICA

honor awards 1957

Outstanding service of 22 individuals and 4 units in ARS cited by Secretary Benson in honor awards event

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■ AWARDS WERE PRESENTED by Secretary Ezra Taft Benson to 22 individuals and 4 work units in ARS (22 units and 136 individuals in USDA at large) May 21 in the Tenth Annual Honor Awards Ceremony.

ARS winners of the Distinguished Service Award:

CALLIE MAE COONS, Chief, Human Nutrition Research Division, for leadership in national research leading to basic findings invaluable to USDA and others in the furtherance of our national nutritional health.

S. B. FRACKER, Assistant to the Administrator, for illustrious performance as research scientist, coordinator of national and international research, and diplomat in world agricultural scientific affairs.

R. W. JACKSON, Northern Utilization Research and Development Division, for distinguished leadership, creativeness, and authorship on protein and fermentation chemistry, thus advancing science and agriculture.

ARS winners of the Superior Service Award:

Animal Husbandry Research Division—B. R. BURMESTER, for creative research in determining the basic cause of lymphomatosis as a virus, how it is transmitted, and the development of promising control measures for application to this country's poultry industry.

Crops Research Division—E. V. ABBOTT, for leadership in creating improved disease-resistant sugarcane varieties and for basic research that established him as a world authority on diseases of sugarcane.

C. W. BENNETT, for fundamental research concerning virus diseases of the sugarbeet and other plants, which established principles for efficient and rational development of measures to control those diseases.

J. E. MCMURTREY, JR., for contribution to mineral nutrition of tobacco and other plants, developing a visual diagnosis of such deficiencies, and attaining international leadership in tobacco research.

O. F. SMITH, for developing basic breeding stocks of alfalfa and the new variety Lahontan, which are highly resistant to the troublesome and costly bacterial wilt disease, stem nematode, and spotted alfalfa aphid.

J. C. STEPHENS, for increasing efficiency of grain sorghum production through genetic studies of male sterility, and the development of methods that make commercial production of hybrid sorghums possible.

W. J. ZAUMEYER, for leadership in research on the causes and control of diseases of field and garden beans, and for breeding disease-resistant varieties possessing superior quality and economic importance.

Entomology Research Division—F. MUNGER, for invention and development of apparatus and techniques of great value to citrus-insect investigations, with applications to entomological research in general.

L. F. STEINER, for invaluable service to the cooperative Mediterranean fruit fly eradication campaign in Florida by farsighted planning, organization, and coordination of chemical control research on this insect.

Eastern Utilization Research and Development Division—R. K. ESKEW, for exceptional initiative and leadership in the creation and development of new processes and products that have brought about a substantial increase in utilization of our agricultural commodities.

Northern Utilization Research and Development Division—L. R. BAIR, for ingeniously solving problems and contributing significantly to research on agricultural commodities through creative design and precision construction of complex scientific instruments.

A. K. SMITH, for meritorious creative contributions advancing basic knowledge of soybean proteins, leading to their isolation and characterization, pilot-plant production, and increased industrial and food uses.

I. A. WOLFF, for creative and meritorious contributions to fundamental carbohydrate chemistry, providing foundations for development of new uses for cereals, and thereby advancing science and agriculture.

Southern Utilization Research and Development Division—R. J. CHEATHAM, for leadership, organizational skill, creative imagination, and exceptional judgment and

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initiative in directing successful research work that advances present and new uses of cotton.

R. O. FEUGE, for expanding utilization of edible vegetable oils by research developing essential basic information, new and improved equipment and methods, and new products for hitherto unavailable markets.

Western Utilization Research and Development Division—A. A. KLOSE, for sustained research contributions to the country's poultry industry, leading to higher quality processed products, greater consumer satisfaction, and increased consumption of poultry.

Meat Inspection Division—E. N. TIERNEY, for skill in public administration and international and intergovernmental relations in handling an essential part of USDA's complex problems in connection with exportation and importation of meat and meat food products.

Plant Pest Control Division—L. S. STUART, for promoting mutual industry and Government understanding and acceptance of policies, standards, and test methods pertaining to the interstate distribution of chemical germicides, disinfectants, and sanitizers.

D. WHITTAM, for initiative, diligence, and effectiveness in improving and applying aerial pest-control equipment and operational methods, and for fostering USDA and industry teamwork in pest-control activities.

ARS work units cited for Superior Service:

Animal Disease Eradication Division (Madison, Wis., station), for organizing and implementing the cooperative Federal-State brucellosis eradication program to achieve statewide certified brucellosis-free area status 4 years ahead of the goal set for the Nation.

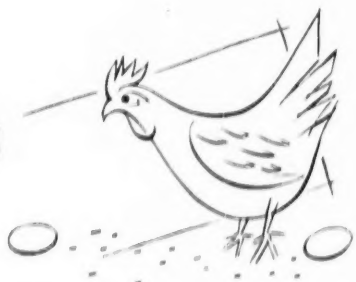
Animal Disease Eradication Division (Olympia, Wash., station) for organizing and implementing the cooperative Federal-State brucellosis eradication program to achieve statewide certified brucellosis-free area status 4 years ahead of the goal set for the Nation.

Key personnel of the Plant Pest Control Division (Lake Alfred, Fla., station), for unusual initiative, diligence, and efficiency in organizing and executing a campaign for containing and suppressing an outbreak of the highly destructive Mediterranean fruit fly.

Regionalization Work Group for Management (Washington, D. C.), for developing effective administrative policies leading to the decentralization of ARS administrative functions to regional business offices. ☆

POULTRY · POULTRY · POULTRY · PO

SELECTING THE BEST LAYERS



■ THE NUMBER OF EGGS a hen lays in a fixed period of time may not in itself be a very accurate indication of her value, a USDA survey reveals. Equally important are various environmental conditions and the hen's previous production record.

A hen's egg production tends to drop off in proportion to elapsed time after the first egg she lays. Compare the December production for two families of chickens, one of which began to lay in August and the other in October. The latter family might appear to produce eggs at a more rapid rate—but only because the birds had laid a shorter time.

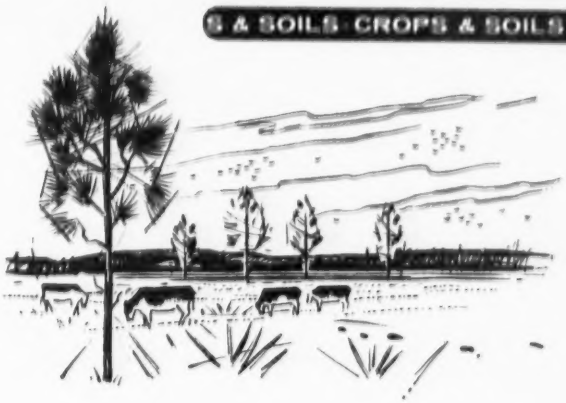
Rate of egg production depends also on daily light and dark periods. Generally, 13 or 14 hours of light each day are most favorable. But chickens differ in their daily light needs. And they differ, too, in their response to increase in light.

ARS researcher T. C. Byerly suggests that breeders could determine the value of a flock more accurately by checking these nongenetic factors. This could be done by running 3-month tests under a controlled environment, measuring daily light and dark needs, light response, and rate of declining egg production. Estimates of production thus made could conceivably equal yearlong similar tests made under natural conditions. In this way, best producers could be selected immediately, saving considerable time and insuring the highest possible egg production.

Breeders need to find out how nongenetic factors influence egg production. Then they can separate and study the heritable factors to check their influence on production and thus breed better laying hens.

In evaluating egg production by present methods, results should certainly be adjusted to allow for differences in time of hatching and date of maturity, according to Byerly. ☆

MORE from Florida Range



Factors in range and cattle management may be key to better return from both beef and forest

■ SCIENTISTS ARE LOOKING for ways to increase forest range productivity in Florida, where Spanish cattle were first introduced by Juan Ponce de Leon in the early 16th century.

Researchers want to integrate timber and livestock production as well as improve grazing management practices through better use of native and improved pastures. USDA's Forest Service and ARS are cooperating here with landowners and the Florida Agricultural Experiment Station.

Since native ranges have limited nutritional values, particularly during the dry winter months, there is great need for improved range and livestock management techniques. This is reflected in the average value of Florida cattle: $62 compared to the United States average of $91.60 on January 1, 1957. Average weight of Florida's slaughtered cattle was 808 pounds compared to the national average of 969 pounds in 1956.

Native ranges basic to beef

Native ranges form the foundation of the State's beef cattle business; they provided 73 percent of the forage in 1955. Some cattlemen use only native ranges—that is, the fine flatlands with 170 species of forage plants; the dry prairies of cabbage palmetto; the poorly drained prairies with 100 plant species; and the hammocks and oak scrubs.

Other cattlemen supplement the low quality of the native grasses with improved pastures. And a few use only improved pastures. Plantings chiefly include Pangolagrass, St. Augustine grass, Bermudagrass, and Argentine and Pensacola bahiagrass.

Winter forage low in quality

Cattle lose 50 to 150 pounds during the winter because ranges lack good-quality forage. Research shows that cows fed supplements, including oranges and grapefruits, are in better condition than those on native pastures alone. There are indications that lack of protein, phosphorus, and some trace elements may cause low calf crops (South Florida average: 50 percent in 1954). At weaning time, calves may be as low as 225 pounds; with adequate nutrition, the weight goes up to 500 pounds.

Scientists collect and identify range plants in south Florida and investigate growth habits, herbage production, and nutritional value. They plan to study calf crops, weaning weight, mineral consumption, and water needs of beef cattle on native ranges. Although ranges are often under water during the summer rainy season, ranchers run short of water during the dry late winter and early spring. They pump from shallow wells into troughs or let water flow onto the ground. Some dig deep pits.

To obtain high production of livestock without any deterioration of range vegetation and soils, the optimum rate of range stocking and use must be determined. Researchers will also study the performance of brood cows on native ranges under different systems of management. Cows are frequently bred to calve in December or January, when danger from screwworms or other parasites is lower. Calves can then be weaned prior to high-water season. The effect of these high-water periods, which reduce grazing in the wet prairies and increase livestock concentration in dry areas, will be investigated.

Many practices to get study

Many cattlemen burn ranges to provide green foliage for winter and early-spring grazing. Some burn the grass in September, some in May, some every 3 years. Others burn sections progressively from November to February. Effects of these practices will be studied, along with the value of grazing as a protection against wildfire. (Grazing prevents accumulation of dry grasses, reducing fuel sources of accidental burnings.)

Research will also include studies of competition between cattle and deer for forage; effect of parasites on range cattle; certain control techniques; and methods of decreasing shrubby, low-value saw-palmettoes. ☆

PUT THESE WOOLENS IN THE WASHER

Resin mixture counteracts cause of shrinkage, holds promise as practical garment treatment

■ A SHRINK-RESIST treatment making woven and knitted wools washable in machines shows promise in USDA work. A mixture of two resins is applied to the wool's surface layers.

Wool shrinkage is most commonly caused by felting—the progressive entanglement of fibers and hardening of fabrics due to moisture, heat, and mechanical action. It can also be caused by relaxation of strains left in the material after processing. These strains are relieved on wetting the fabric and raising the temperature, thus causing shrinkage. Loosely constructed fabrics, such as knit goods, generally shrink as a result of both fiber relaxation and felting.

Best control of shrinkage was obtained with blends of polyamide and epoxy resins—complex chemicals obtained in part from products such as animal and vegetable fats. Both resins are commercially available and fairly cheap. They give coatings that can be air dried or baked at mild temperatures to give tough, flexible films. Moreover, these films resist aging, high temperatures, light, moisture, and chemicals. And they show great adhesion to many materials.

Resin blend simple to apply

Treatment of the wool is simple. Fabric is first conditioned by wetting and drying, then soaked in a water emulsion of polyamide-epoxy mixture. After drying, the fabric is baked at a mild temperature to fix the resins in the fiber surface. It is then machine washed and dried.

Felting shrinkage is eliminated by this new treatment and relaxation shrinkage is eliminated after the first washing. Pilling (formation of small balls of wool on the fabric surface) is greatly reduced. There is little or no change in tear strength. Water resistance is unimpaired and in some cases is improved. Repeated launderings in a home washer have no effect at all on the treated fabric.

Softening agents under test

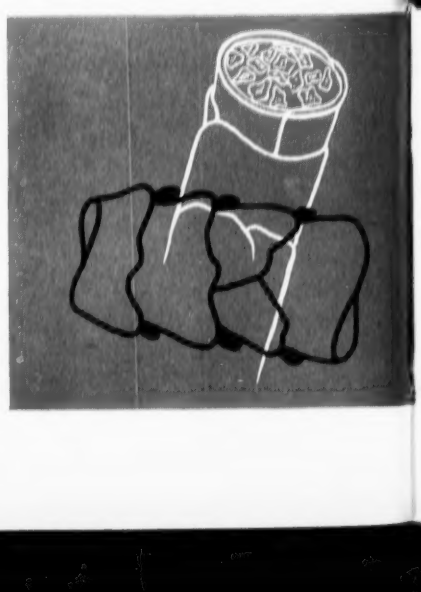
Fabric stiffness increases slightly, however, and handle (how the fabric feels) is altered somewhat by the resin treatment. Researchers are trying to offset this by adding softening agents to the resin blend.

So far, the resin treatment has been applied to test socks, sweaters, and flannel and jersey goods. Tests indicate that the fabric for looseknit sweaters must carry 7 to 10 percent of the resin, socks 4 to 5 percent, and flannel goods 2 percent. ARS wool researchers H. P. Lundgren and associates of the Western Utilization Research and Development Division, Albany, Calif., hope to lower these requirements by changing the resin formulation and by refining the methods of applying the resins.

Estimates on cost of the treatment are quite low; prices should be well within practical limits.

The new treatment was derived from continuing USDA work on fiber and fabric modifications. Many resin types and mixtures were studied, as well as methods of treating, drying, and curing. Special attention was given to the effect on fiber properties, fabric handle, and strength, and to the permanency of treatment.

Despite the limitations of the polyamide-epoxy treatment, it comes close to meeting requirements for an ideal shrinkage-control finish. Other combinations of these resins—and other resins—are under test. This treatment is still in the laboratory stage but shows great potential. ☆



SOCKS (above) show results of new resin treatment. Treated sock was washed in a home washer, did not shrink. Untreated sock shrank 30 percent compared with the control sock. Treatment costs are low.

SHRUNKEN sweater (above) was originally same size as resin-treated sweater. Both are shown after washing and drying. Treated garment is soft and keeps size. Similar results were obtained on socks.

ANCHORING resins in the fiber surface prevents wool shrinkage. Chemicals are permanently attached to surface scales, preventing them from consolidating into tightly packed entanglements, or felting. Felting usually occurs in home laundering.

Facts on Farm Fatalities

■ THE FATAL-ACCIDENT RATE has been increasing on our farms in this country, according to a USDA tabulation of available data.

ARS agricultural economist John Rush analyzed information from death certificates provided by the National Office of Vital Statistics. Fatality rates for accidents on farmland and about service buildings increased from 6.7 per 100,000 persons during 1940 to 1943 to 10.3 during 1949 to 1953. (Figures are based on information not comparable in every detail because of classification differences.)

During the 14-year period, 30,521 fatal accidents occurred on United States farms. This does not include either disabling injuries or fatal accidents that occurred in the homes or off the farms (such as traffic deaths). Rush pinpointed the time and kind of accidents, the age group, and States in which accidents were most frequent.

Of the farm accidents occurring between 1949 and 1953, the greatest cause in 43 States was machinery. Drownings were the chief cause of deaths in Arizona and Texas, and firearms were the main factor in Rhode Island and West Virginia. Nevada deaths resulted equally from machinery, animals, firearms, and falls. Other accidental causes included electricity, lightning, and blows from falling objects.

The greatest number of fatalities occurred in the 15-to-19 age group, indicating that many young people had not acquired necessary skills or taken proper safety precautions in using farm machinery. Next greatest number of fatalities was in the 10-to-14 age group, followed by children under 5. The 20-to-24 age group was safest.

An earlier Indiana Agricultural Experiment Station study indicates more accidents occurred at 10 a. m. than any other time. Next peaks were at 3 p. m. and 6 p. m., when fatigue possibly reduces alertness.

About one-fifth of all fatal farm accidents during 1949 to 1953 occurred in the Corn Belt States. An eighth of the accidents were in the Northeastern and Appalachian States. The largest number was in Texas, with 727; followed by Pennsylvania, 571; Illinois, 555; Iowa, 544; Wisconsin, 528; Missouri, 525; Ohio, 522; and California, 506.

Rush made a study in South Carolina between 1946 and 1955, on the basis of newspaper clippings. He tabulated fatal accidents of farmers and rural residents—including mishaps in the home and on the highway. About one-fifth (19 percent) of the accidents were on farmland.

More fatalities occurred in December than any other month. July followed closely. Drownings occurred mainly in May, June, and July. Burns were most frequent in November through February, when farm people are exposed to fireplaces and unguarded stoves. Machinery fatalities were highest in August. Pedestrian deaths topped the list in November, and motor vehicle collisions led in September. ☆

GOOD SUBJECTS for insect physiology laboratory, cochroaches are larger, more durable than many other insects. Here, king-size South American cockroach is pinned in place and scientist removes nerve cord with tweezers, special scalpel. This living cord will be placed on silver or nickel electrode and treated with blood of houseflies that have been dosed with insecticide. If blood contains toxic materials, cockroach nerve reacts. Test is sort of "drunk-o-meter" that's sensitive to extremely small amount of toxin. Insecticide frequently doesn't directly affect nerves—but forms toxins that do. Problem: To find where toxins are produced, where they act to kill insect, what has changed when the insects become resistant.

THE *Cockroach*

ENTOMOLOGISTS' GUINEA PIG

Researchers try to learn why insects differ in response to our chemical insecticides, repellents, and attractants

ORGANS ARE TAKEN from cut-up cockroaches that have been treated with insecticide in which radioactive material is used to trace the course of the insecticide in an insect's body. Here, an extract of a dissected roach organ is counted to show the distribution and solubility of a radioactive insecticide and its metabolites. Studies with radioactive tracers have shown that insecticides are largely degraded inside insects to nontoxic materials. An increased ability to destroy the insecticide is one of the suspected causes of resistance. Entomologists hope to find materials that become hitched to the degrading enzymes and keep them occupied while the insecticide goes on about its business. In this case, too, the cockroach's suitability to dissection proves valuable.

■ THE COCKROACH, inhabitant of the world for 40 million years, has at long last become a useful creature.

This insect is being used in entomological research much as guinea pigs, rabbits, rats, and mice are used in studies of human pathology.

At least 12 species of cockroaches are being maintained as "cultures" at USDA's Agricultural Research Center, Beltsville, Md. They range from less than half an inch long to 2-inch winged giants from South America. There are native American roaches, the German species, and a variety from other countries.

Some resistant to chemicals

And—of considerable importance to research—there are insecticide-resistant strains of one species as well as many nonresistant species.

The cockroach cultures have many uses in laboratory work at Beltsville. They are helping ARS scientists determine the reasons for insecticide resistance that is building up in many species. Cultures are being used in standardized tests of aerosol and other household space and residual sprays to determine effectiveness and quantities required, and to provide a basis for accurate labeling.

Cockroaches are also used in the study of other chemical formulations that may find an important place in control. Among these materials are repellents and attractants, which may eventually become highly useful means of combating infestations.

Rearing of the cultures is important by itself. This work permits close study of the habits and characteristics of different varieties of

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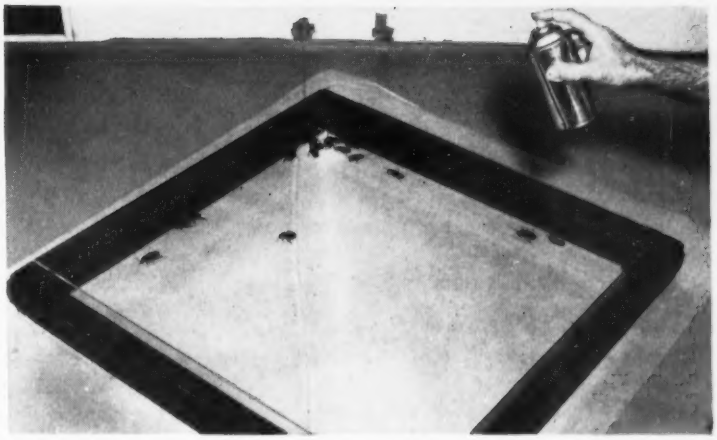


SPACE AEROSOLS are tested in chamber specially designed for the purpose, using cockroaches as "guinea bugs." The cockroaches are placed in glass-walled pens on the floor of the test chamber. The glass walls are coated with a thin film of oil to prevent the cockroaches from escaping. Normally, the materials being tested are applied from the outside through a special nozzle located above the portable pen. Aerosol material that's under investigation is sprayed in given quantity and time, usually on about 20 cockroaches of 1 species, evenly divided as to sex. Effectiveness of test material is determined by the number of each sex dead or moribund at the end of a predetermined test period. An effective insecticide may kill all the insects, and some may be less effective in destroying females than the males.

REPELLENTS ARE under test at Beltsville in effort to find chemical formulations that drive insects away from places that are not accessible for cleaning but offer pests shelter, darkness. Cockroaches are placed in white porcelain pans with food, water. Two V-cuts are made in rims of ice cream cartons; two cartons—one treated with repellent, the other untreated—are placed upside down in each pan. Since cockroaches hate strong light in test chamber, they seek shelter in the boxes. With a good repellent, there will be few or no cockroaches in the treated box; the untreated box will be crowded. Beltsville scientists have thus far found 1 chemical that effectively repelled 8 of 9 species. Goal, of course, is to find a repellent effective on all species.

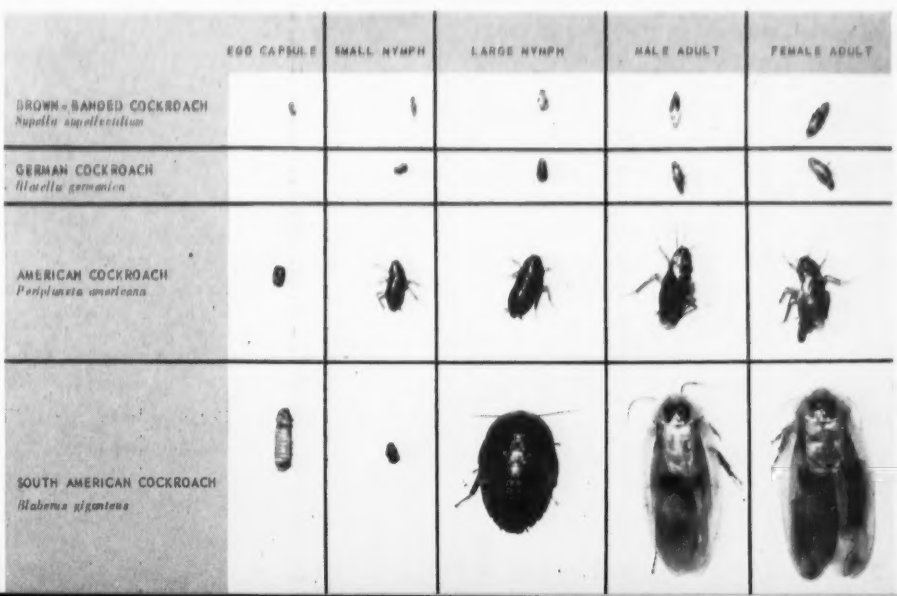
roaches—knowledge that is needed for effective control or eradication.

Physiology studies valuable

Also, because roaches are relatively large, they are excellent laboratory subjects for dissection. Such use should greatly increase knowledge of insect physiology and may easily lead to findings of major importance to human pathology. Dissection also offers a means by which the effect of chemicals on insect organs can be studied. Radioactive insecticides are used on the roaches, then instruments that measure radioactivity show presence and quantities of insecticide in various organs of the insects.

Dissection is also a part of other physiological studies involving treatment of roaches with insecticides and later recovery of such materials from

FOUR COCKROACH SPECIES of the 12 raised at Beltsville for laboratory purposes are shown in different stages of the life cycle. Female adults of brown-banded cockroach often deposit egg capsules in television and radio cabinets and furniture. Capsules of German cockroach, common to many areas in the United States, are carried by female until eggs are ready to hatch. American cockroach, native of tropical and subtropical America, is also common in many parts of the country. Female adult is shown carrying egg capsule, which she deposits several weeks before young are ready to hatch. Well over 2 inches long is South American cockroach. Egg capsule is pictured for comparison; normally, it's retained within female, where eggs hatch, and young are born alive.



the insects' organs to determine possible changes in their tissue.

Cockroaches themselves demonstrate the need for this research. These insects are a growing problem despite modern insecticides. Take the German roach, for example. An early immigrant to this country and now widespread, it has recently become resistant in some areas.

Resistant roaches spread from colony to colony. This makes control or eradication measures difficult.

New species spreads rapidly

The brown-banded roach, rarely seen 20 years ago, shows how fast a species can spread. This one is now common in eastern, southern, and midwestern sections. Possessing many pernicious habits of the cockroach family, this species also tends to settle in dark recesses of electric switch and fuse boxes and in radio and television cabinets. Here the females deposit egg capsules, each one of which may produce a dozen or more lively offspring. The life cycle is completed every 3 months.

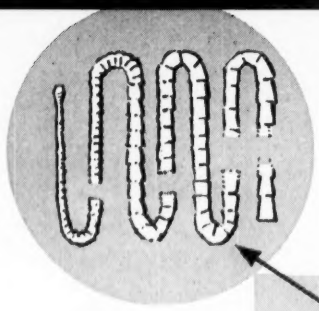
This relatively long life cycle may explain why the brown-banded roach has not developed resistance to insecticides as has the German roach, which requires only 6 to 8 weeks.

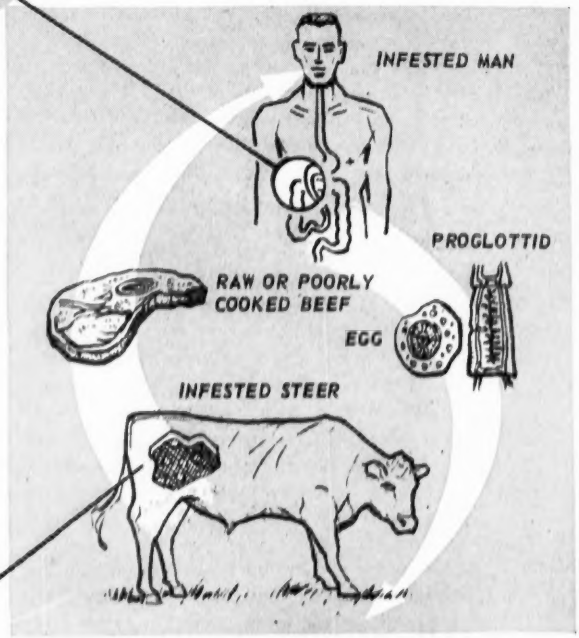
Nevertheless, the brown-banded roach poses a threat in this respect. If it should become resistant, control would be difficult because of the many places where this roach deposits egg capsules within a building.

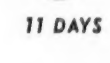
The brown-banded roach is 1 of 6 more common species in many areas of the United States. Since World War II, we have been invaded by at least three new roaches, all of which can spread. Thus, as we battle established species, we must be prepared to keep newcomers in check.

All this not only adds to the need for effective insecticides but also creates a need for repellents and attractants as additional weapons. ☆

how to fight

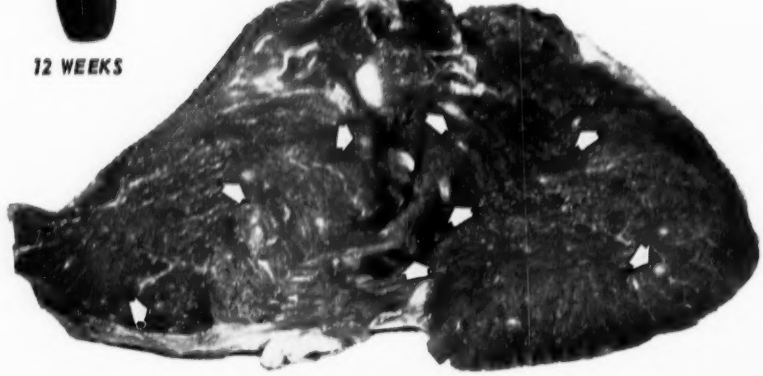






MAN harbors adult parasite—*Taenia saginata*. Parasite's eggs and proglottids (viable sections) are passed in excrement of an infested man and can be picked up and swallowed by cattle. Larval stage—*Cysticercus bovis*—develops in muscular system of cattle. Larvae soon become encysted. Man can then acquire the parasite by eating the raw or poorly cooked beef of an infested animal, thereby beginning another cycle.

INFESTED masseter (cheek) muscle of a beef animal shows 64-day-old cysts. Larvae found inside the cysts are shown at left. Meat infested to this extent would be condemned by Federal inspectors.



the TAPEWORM

Meat inspection and human sanitation are essential to stop the spread of this parasite, which attacks man as well as cattle

■ WORK BY USDA, STATE agencies, and the livestock industry is closing in on a potential menace to man and livestock—the beef tapeworm.

The tapeworm is found in cattle in a cystic or larval form (*Cysticercus bovis*) and in man as the adult tapeworm (*Taenia saginata*). The infestation in cattle is commonly known as "measly beef" because cysts give the carcass a spotted appearance.

Nationwide incidence of this parasite is fairly low due to our high sanitary levels and the effectiveness of USDA meat inspection. But the Southwestern States — particularly Arizona—have been hard hit the last few years. Greatest loss comes from condemnation of carcasses containing parasites and from increased processing costs. Feeders can expect to lose 5 to 8 cents a pound in marketing carcasses not condemned.

Federal meat inspection regulations require that heavily infested carcasses be condemned outright. Those with only a few cysts that can be readily seen and cut out are passed for processing. To make sure that any cysts not seen and removed by the inspector are destroyed, meat is refrigerated at 15° F. or lower for 10 days, or heated to 140° F.

Rare beef is larva source

Man acquires the parasite by eating raw or slightly cooked beef containing the larvae. Cattle acquire the parasite by swallowing the tapeworm eggs—passed by infested humans—in contaminated pasture, feed, or water. Microscopic eggs hatch inside the body of cattle and the embryos are carried through the blood stream to all parts of the body. In the muscles, they develop into larvae and become encysted. Cysts containing the larvae are most commonly found in the muscles of the heart, neck, cheek, tongue, and diaphragm.

Larvae mature in 8 to 20 weeks. If ingested alive by man, a larva develops into a mature tapeworm in about 3 weeks in the new host.

Many agencies join in study

Some important new information on this menace has come out of cooperative research that was started a little over a year ago by several agencies—ARS, Arizona Cattle Feeders Association, Arizona State College at Tempe, Arizona Health Department, and the State Veterinarian.

For example, researchers found that holding infested animals for a long period of time does not result in safe absorption or disappearance of the tapeworm cysts, as was thought likely. Live cysts were still found in infested animals held for over a year. Carcasses of these animals would either be condemned or, at best, passed for processing only.

Researchers also showed that study of organisms within a cyst will show how old it is; a researcher can thus tell when an animal was exposed. This should be a real help in tracing the source of infestation.

Few if any clinical symptoms were found by scientists in infested test animals. They all gained weight normally even during periods of heavy infestation. This finding is contrary to commonly held beliefs that such animals suffer weight loss, roughened hair coat, even death.

Scientists traced many cases of *Cysticercus bovis* in the Southwest to contamination by workers infested with *Taenia saginata*. For example, in an Arizona herd of 1,930 cattle pastured and pen fed in 1955, 849 head, or 42.87 percent, were found to be infested when slaughtered. Of these, 833 carcasses were retained for processing and 16 were condemned because they were so heavily infested. Investigation revealed that the concrete-lined irrigation ditches used to water cattle were contaminated by wastes from infested laborers.

Researchers list several steps in tapeworm eradication. First is cooperation between the medical and veterinary professions to break the life cycle. Careful tests of all farm and feedlot workers to insure that carriers are not endangering cattle should be routine. It might be advisable to test farm and ranch laborers entering this country to determine whether they carry the parasite.

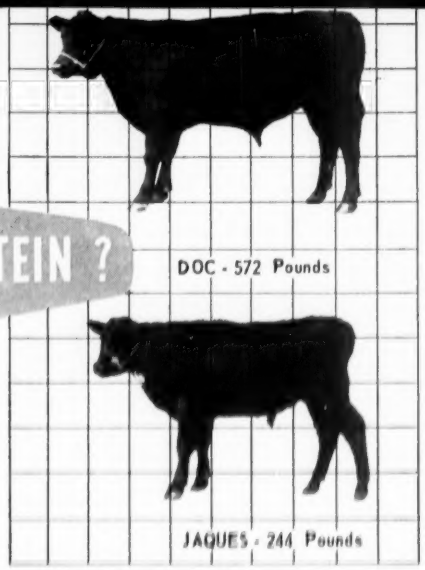
Sanitary facilities important

Thorough, systematic meat inspection is important in breaking the cycle where the parasite is transmitted from cattle to man. A recent report from New Mexico emphasizes this point. Of 179 animals, 123 were found infested with *Cysticercus bovis*. Four carcasses were condemned. Cysts were removed from the balance of the carcasses, which were processed as an additional precaution.

Finally, sanitary facilities must be provided on farms where cattle are fed or pastured. Laborers should be told why such facilities are important and must be required to use them. Slaughter animals should not be grazed on lands fertilized or irrigated from untreated sewage systems. ☆

WHAT'S 'ENOUGH' PROTEIN ?

Calves gain normally on a growing diet after winter on maintenance ration with 0.3 pound of protein daily



RATION lowest in protein and calories made bottom twin lose 26 pounds during a 6-month test. It grew rapidly when well fed. Control twin at top gained well on good feed.

■ BEEF CALVES CAN get by on very little protein—recent research shows just how much—when they must be limited to barely holding their weight on low-quality winter forage.

A 400-pound calf on a maintenance ration (not gaining weight) does all right on as little as 0.3 pound of digestible protein daily for as long as 6 months, according to experiments at USDA's Agricultural Research Center, Beltsville, Md. This cuts in half previous recommended minimum allowances for wintering calves.

Along with the protein, of course, cattle must get enough calories to maintain body weight. This is 3 pounds of TDN (total digestible nutrients) daily for a 400-pound calf.

Some allowances can be cut

Recommended protein allowance set up by the National Research Council for a 400-pound growing calf is 0.9 pound a day for a daily gain of 1.6 pounds. Under winter range conditions 0.7 pound of protein a day is suggested for a daily gain of 1 pound. This is the lowest protein allowance recommended for calves so far by the Council. ARS research shows that under some conditions, however, calves can get along on less.

Protein supplements are expensive. Beef producers forced to winter calves on skimpy rations need to know exactly how much protein is enough for maintenance. Whether or not a cattleman chooses to feed for winter gains or for maintenance will probably depend on his estimate of profits from each management method.

Series of studies conducted

This study by ARS animal physiologist C. F. Winchester and coworkers follows two other studies using identical-twin beef calves. Growth of calves 6 to 12 months old was interrupted for 6 months with no ill effects when diets included enough protein, carotene, and minerals. Animals recovered quickly and profitably (AGR. RES., March 1954, p. 8).

These scientists later showed that animals 3 to 4 months old could lose weight temporarily on low-calorie winter forage and still recover to make good gains and good beef (AGR. RES., July 1956, p. 16).

In the recent tests to establish minimum protein requirements, 8 different pelleted rations were fed to 11 pairs of 6-month-old identical-twin calves for 6 months. One animal of each pair was fed a low-protein diet, the control twin a higher protein diet. Rations varied from a low-calorie diet containing only 2.5 percent digestible protein to a high-calorie diet with 11.4 percent. Three rations provided for weight maintenance only, 3 for a gain of 1 pound daily, and 2 rations provided for a gain of 2 pounds daily.

Protein and calories varied

Animals fed the rations lowest in protein and calories lost weight during the test period. They gained slightly when protein content was increased even though calorie content was unchanged. Animals on rations with more calories gained from 1 to 1.9 pounds a day. Greatest gains were made on high-calorie diets liberally supplied with protein.

After 6 months on restricted rations, animals were fed as much of a good growing diet as they could eat. Two animals fed diets lowest in protein averaged 1.14 and 1.22 pounds of gain daily for the trial, compared to daily gains of 1.35 and 1.43 pounds for their better fed twins.

Overall feed efficiency of pairmates was about the same regardless of diet. Body size and carcass grade were about the same, too, although underfed animals needed 3 additional months to reach slaughter. Lean meat of the underfed animals was good, although fat flavor wasn't quite as good as that of the better fed animals. This suggests that combined protein and energy restrictions more severe than those of the tests might unfavorably affect meat flavor.

(Identical twins are especially useful in nutrition research. Such twins come from the same egg and thus have common inherited characteristics. It's assumed that differences between pairmates are due to treatment rather than to their inheritance.) ☆

New Era in Breeding Research

Extensive use of artificial breeding studs aids our dairy studies

■ VIRTUALLY ALL THE Nation's dairy bulls used in artificial insemination recently became available to USDA and cooperating State researchers for use in breeding studies. Three artificial-breeding organizations joined in providing service.

The agreement was made between ARS and the National Association of Artificial Breeders, Columbia, Mo., the American Breeders Service, Chicago, and the Wisconsin Scientific Breeding Institute, Madison.

States now engaged in cooperative dairy breeding studies with the Department—Georgia, Illinois, Indiana, Louisiana, Minnesota, Montana, Ohio, South Carolina, Tennessee, Texas, and Wisconsin—may share in this unusual opportunity to strengthen the work. Individual research projects of ARS and cooperating States may, however, continue to operate under other semen-supply agreements that for special reasons are preferable.

To strengthen the Federal-State studies as a service to the dairy industry, the artificial-breeding agencies have agreed to urge all members to supply semen for research upon request. In return, the researchers have agreed to grant without cost to the owners of any sire utilized in this program the loan of a young bull offspring from that sire—one loan per year for each sire used.

Suppliers of semen can thus introduce into their own breeding organizations some of the bloodlines from the several research herds. If, however, the loan provision is not acceptable to either the association or research leaders, they may agree on the service at a nominal fee.

Breeding already underway

The new latitude of choice is already being utilized in ARS projects. Brown Swiss and Holstein bulls with highest productivity records are being bred to Jerseys, Holsteins, and Sindhi-Jersey crosses at Jeanerette, La., to see how far we can go in combining heat tolerance factors with productivity—also whether productive northern strains (Holstein bulls) will alter the heat adaptation of the locally developed herds at both Jeanerette and Baton Rouge, La.

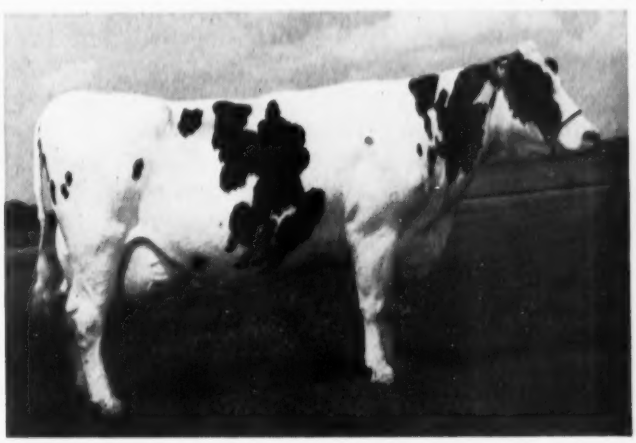
Stud organizations benefit

The researchers also will introduce the highest productivity available through bull sources to see whether it is possible to break through the already-high ceilings of the Holstein herd at Beltsville, Md., and the Jersey herd at Lewisburg, Tenn.

The new arrangement offers great advantage to the research institutions and ultimately to the dairy industry at large. But the various establishments contributing the stud service have much to gain, too. They'll have access to highly productive inheritance in the research herds—for example, the ARS Holstein herds at Beltsville, and Huntley, Mont., and the Jersey herd at Lewisburg.

The agreement further means that the artificial breeding organizations will be kept informed by the scientists about breeding research that is currently in progress or planned. ☆

WINTERTHUR Zeus Burke Champion No. 1,024,856, Maryland Artificial Breeding Cooperative's outstanding proven sire, has already been bred to cow at right through stud's recent agreement with ARS.



BDI GALLANT Joliet No. 2,933,694, Beltsville Holstein in breeding study, produced at 5 years and 9 months of age 18,099 pounds of milk and 756 pounds of butterfat in 305 days (milked twice daily).

FOUND IN JAPAN *Ornamentals*

Important plant introductions offer variety of material for landscape gardening in South

■ THE LARGEST AND possibly finest single collection of ornamentals ever acquired for the South—first important collection of ornamentals for this country in 30 years—was introduced from Japan by USDA last winter.

ARS plant explorer J. L. Creech, traveling under joint sponsorship of Longwood Foundation, Kennett Square, Pa., brought nearly 700 specimens from Japan's southern islands. Half the plants were collected in nurseries, half from the wild. This is in addition to a similar 1955 collection of ornamentals from Japan by Creech. The area has an environment generally resembling that of our own South, with some variation.

The largest plant group consisted of 219 chrysanthemum varieties, to be exhibited next fall at Longwood Gardens. On these trips, Creech made one of the most important collections of *Camellia* species of the last 50 years, including *C. japonica* from its northern limit, and a new race of large-flowered evergreen azaleas.

The collection also included 2 shrubby *Cinnamomum* species and several others, all adapted to saline beaches and the former also to semi-arid conditions; 3 ornamental tea varieties (close kin of the camellia); 26 hollies including the never-collected *Ilex liukiuensis* and 2 variegated and 1 yellow-berried forms of the common Japanese holly; new varieties of the *Cryptomeria* tree; low evergreen species of oak; 6 *Ardisia* species (ground cover for South, potted plant for North); evergreen *Symplocos* species to supplement our deciduous one; variegated and weeping varieties of *Zelkova serrata;* several land and tree-inhabiting orchids.

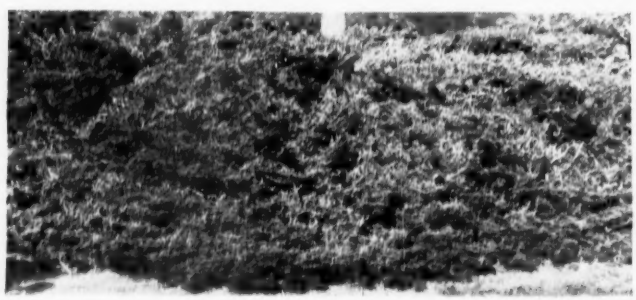
The collection is growing at the Plant Introduction Station, Glenn Dale, Md. As plants are available they will be sent for testing to State agricultural experiment stations and other institutions concerned with horticulture. Several years' observation will be required before any introductions can be recommended. ☆

EXPLORER J. L. Creech examines birch to be tested for adaptability to Northeast. Late azalea *Rhododendron eriocarpum* (below), a Chugai-hybrid kin, does well in heat, sand.

FINE BEACH cover *Juniperus conferta* grew here under heat, is grown mainly in our North.

HANDSOME KIN of the camellia, *Eurya emarginata*, has good garden habit. It grew on rocky beaches and in hot sun on Yakushima Island.

SARGENT VARIETY of *Juniperus chinensis* found growing in the alpine bogs of Yakushima differs from what we grow under that name.



New peach concentrates

Flavorful, well-colored peach puree and frozen peach nectar concentrates are being produced through a new continuous process at USDA's Eastern Utilization Research and Development Division, Philadelphia.

Volatile flavors normally lost in processing are recovered in this process, resulting in an excellent natural fruit flavor. The good flavor is due to rapid inactivation of browning enzymes early in the processing.

Ice cream manufacturers are especially interested in the puree concentrate. It's difficult to make full-flavored ice cream from the delicately flavored fresh or frozen peaches.

Development of these concentrates by ARS researcher Nelson Eisenhardt and associates follows work on methods of preserving flavor essences of strawberries, grapes, apples, and other fruits. The continuous process is not yet in commercial use.

Pilot test on screwworm

Millions of sterile screwworm flies are being released in a Florida pilot test in a continuing study to develop ways to eradicate these costly cattle parasites. Procedures are being evaluated, equipment developed and tested, and personnel trained in preparation for a possible all-out regional eradication program.

USDA and the Florida Livestock Board are cooperating to fight the bluish-green fly that develops in wounds of warm-blooded animals. The parasite did damage of $10 to $15 million in the Southeast last year.

Laboratory-reared screwworms are sterilized in the pupal stages with gamma rays of radioactive cobalt. As many as 2 million flies emerging from the treated pupae are released each week over 2,000 square miles of rangeland southeast of Orlando.

ARS researchers want to introduce enough sterile male flies to cause the majority of the native females to lay eggs that will not hatch. Since many hogs and cattle feed in wood and swamp land, and wildlife serve as hosts, control by any other known method is extremely difficult.

When this technique was used in 1954, at the Caribbean island of Curaçao, the fly population was eliminated. To eradicate screwworms in the

Southeast, a 2-year effort estimated at $9 to 10 million would be required. Quarantines, inspections, and surveys would have to follow, along with necessary treatment, at an estimated cost of $750,000 annually.

The area in the eradication zone is 25 times larger than the area now being treated, 300 times larger than Curaçao. This would include most of Florida and possibly parts of Georgia, Alabama, and South Carolina.

No new mosaic carriers

None of a dozen or more suspected insects transmits the virus causing wheat streak-mosaic disease, scientists have found in a 3-year Federal-State study. Therefore, the only known carrier remains the wheat curl mite, whose role in spreading the disease was proved 4 years ago by Canadian researcher J. T. Slykhuis.

Entomologists R. V. Connin, of USDA, and R. Staples, of Nebraska Agricultural Experiment Station, studied the problem. They surmise that some of the suspected insects might carry the tiny wheat curl mite, but not transmit the virus directly.

This virus, which destroys chlorophyll in the plant, is very damaging to wheat in western Kansas, Nebraska, Colorado, and South Dakota, and to a lesser extent in other States.

Hydrangea color factor

The perplexing and often costly color variation that occurs in hydrangeas of the same variety on different soils isn't due to different pigments in the sepals, as you might have assumed. It's governed by the aluminum picked up by the plant and deposited along with the pigments.

In studies at USDA's Agricultural Research Center, Beltsville, Md., scientists found the same anthocyanin present in the varieties studied, regardless of flower color. The blue flowers had more aluminum than did the red ones. And the scientists identified for the first time four yellow pigments also present regardless of flower color. Aluminum intensifies these yellows. The ratio of yellow to blue may govern the kind of offcolors that trouble florists—the magentas, mauves, and lavenders.

Many people have noticed a tendency of strongly acid soils to produce blue hydrangeas and mildly acid soils to produce red ones. Some thought acidity in soils altered the composition of the plant pigments. But the acidity merely regulates the availability to hydrangeas of the aluminum in the soil. In general, the greater the soil acidity (the lower the pH value) the more available is aluminum. Mildly acid soils can't supply much aluminum to plants.

Since these basic principles have been clarified, our scientists may now

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be able to work out a system of nutrient control, including chemical supplements, that will affect relative amounts of the various pigments to give dependable color control.

Plant physiologists Sam Asen and N. W. Stuart, ARS, and horticulturist H. W. Siegelman, Agricultural Marketing Service, made the study.

To pin, or thread baste

Many home sewers find thread basting a tedious operation. Is it worth the time, or is it more efficient to pin the seams for stitching?

Clothing specialists in the USDA Home Economics Institute compared the time it took a professional seamstress to do certain clothing construction operations when fabric was pinned and when it was thread basted.

When pin basting was used, it took less time to insert an extension band in a blouse front; stitch sleeves to armholes; and apply a flat, shaped collar to a neckline. Thread basting, on the other hand, reduced the time needed to apply a double yoke to the

back of a shirt and a collar to the neckline of a sport shirt.

Thread basting, however, produced superior finished work in nearly all cases, ARS clothing specialist Margaret Smith reports. There was not much difference in appearance of flat, shaped collars sewed on by different methods, where collar and blouse curves were almost identical. But pin-basted set-in sleeves tended to pucker and stitching lines were irregular. When an extension band was inserted in a shirt front, the folded edge tended to slip out of place and was not caught with the stitching. Stitching the pinned sportshirt collar to the neckline—which involved joining a straight edge to a curved one—was most difficult. Many small pleats were caught in the stitching and the stitching itself was uneven.

The cotton percale used was firm enough to hold position in stitching. Results might be different with slippery or less firm materials such as sheers or crepes of silk or manmade fibers. A less experienced seamstress might get different results, too.

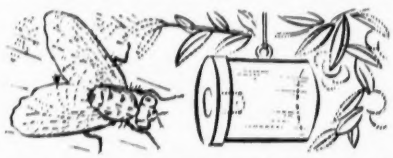
Oriental fruit moth

Information on all species of parasites known to attack the oriental fruit moth will be published by USDA entomologist H. W. Allen of the ARS laboratory at Moorestown, N. J. The review will be available upon completion of certain studies now underway to fill in some of the gaps about life cycles of the parasites.

Information accumulated on these parasites over about 30 years will be brought together. Biology and distribution of more than 100 parasites will be discussed. Some of these insects originally had limited distribution and have recolonized in new areas. Sketches of the wing patterns of different species will be included. This compilation will be of great value to scientists who are interested in biological control of insects.

Windup on the Medfly

The Medfly quarantine has been removed in all Florida counties under Federal regulations. State quarantines will continue in other areas, with host fruit and vegetables treated and certified for movement. USDA will



continue to cooperate with the Florida State Plant Board in statewide trapping and in spraying where isolated infestations are found.

The cooperative eradication campaign has been successful, thanks to extensive aerial spraying and some spraying with ground equipment, supplemented by soil treatment. Quarantine enforcement and attractant-baited traps also played a part.

The initial Federal quarantine was invoked on May 16, 1956, soon after the fruit and vegetable pest was reported in the Greater Miami area. On May 21, 1957, approximately a year later, the regulations were lifted in the remaining portions of Dade and Lee Counties. State regulations are being continued in force in the counties of DeSoto, Highlands, Hardee, Hillsborough, Polk, Pasco, Manatee.

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